Quest Journals
Journal of Research in Humanities and Social Science
Volume 12 ~ Issue 7 (2024) pp: 312-315
ISSN(Online):2321-9467
www.questjournals.org

Research Paper

Research on the Effect of Anaerobic Threshold on Improving Adolescent Endurance Quality

Sun Lin
School of Liberal Education, Liaoning University of International Business and Economics, China

Abstract: *This study adopts methods such as logical analysis and literature review to analyze anaerobic threshold from multiple aspects and summarize its impact and role in improving endurance quality in adolescents. Research has found that the anaerobic threshold has a positive effect on aerobic capacity and can serve as a reference indicator for aerobic capacity. The timing of the onset of anaerobic threshold in adolescents represents aerobic endurance levels. Maintaining a training load heart rate between 130-170 is beneficial for the development of aerobic capacity in adolescents. Using anaerobic threshold training at around 80% intensity to maintain anaerobic threshold can effectively improve aerobic capacity, and around 60% intensity can be used for recovery training.*

Keywords: *teenagers; Anaerobic threshold; Endurance; training method*

R*eceived 14 July, 2024;* ***R****evised 28 July, 2024;* ***A****ccepted 30 July, 2024* © *The author(s) 2024.*
P*ublished with open access at* ***www.questjournals.org***

At present, China's sports training level maintains a high level in many events and ranks among the top in the world in terms of sports performance. Even in track and field events where there were significant shortcomings, there have been huge breakthroughs in recent years. From Liu Xiang to Xie Zhenye, Su Bingtian and other outstanding athletes who have created excellent results, they have always told us that although there may be some differences in race, with the advancement of science and technology and the innovation of various training methods, our progress is very obvious and effective. This is closely related to our active summary of shortcomings while incorporating new training methods. But in terms of the number of people participating in sports, China still has a slight disadvantage, which poses obstacles to our future development as a sports powerhouse. Fundamentally speaking, reserve talents still need to be cultivated from primary and secondary school students. Therefore, it is particularly important to cultivate excellent young athletes and provide a continuous supply of reserve talents for national sports. There are differences in physical function between adolescent athletes and adult athletes, and the anaerobic threshold varies among athletes of different ages and events. What we need to do now is to determine the anaerobic threshold of adolescents and develop a reasonable training intensity based on this value; How to use anaerobic threshold in training to scientifically develop training plans to effectively improve athletes' endurance level.

I. Cognition of anaerobic threshold

In the process of sports training, scientific training methods are crucial for teenagers to improve their athletic performance. This is closely related to how coaches develop reasonable and effective training plans and the personal qualities of young people. The anaerobic threshold, as an important indicator of aerobic capacity, has been widely used and developed by later generations since its inception. It plays an extremely important role and significance in improving the endurance quality of teenagers.

1.1 Origin of Anaerobic Threshold

Since Wasseman proposed the concept of AT (Anaerobic Threshold), a large amount of research has been conducted, and many scholars have confirmed that the correlation coefficient between VT (Ventilatory Anaerobic Threshold) and endurance sports performance (r=0.89) is higher than VO2max (r=0.64). Therefore, anaerobic threshold is more representative of human aerobic capacity than VO2max, and seems to be an independent, VO2max independent indicator reflecting aerobic metabolic capacity.

Anaerobic threshold refers to the percentage of maximum oxygen uptake and its corresponding

exercise intensity that the human body can utilize to the fullest extent during increasing load exercise, without the accumulation of lactate in skeletal muscles. The "threshold" value is defined as the intensity of a certain stimulus that causes a sudden change in physiological indicators.

1.2 Application value of anaerobic threshold

In recent years, many biologists have conducted extensive research on anaerobic threshold. Compared with endurance evaluation indicators such as maximum oxygen uptake, anaerobic threshold is more closely related to oxygen transport and metabolism levels, and has a higher correlation with training level. Therefore, using anaerobic threshold to evaluate human aerobic capacity is more meaningful. There is a significant correlation between anaerobic threshold and 3600 meter run, and there is good consistency[1]. There are also studies indicating a high correlation between anaerobic threshold running speed and 12Min running performance[2]. All of these prove that anaerobic threshold is the key to evaluating aerobic capacity[3]. In addition, anaerobic threshold training can effectively improve and promote cardiopulmonary function and aerobic metabolism[4]. During the training process, the improvement of aerobic capacity can be judged by measuring the anaerobic threshold, but each athlete's ability to resist lactate under the load of anaerobic threshold is also different. Therefore, it is necessary to understand each athlete's anaerobic threshold in order to evaluate their aerobic metabolism ability. Today, the anaerobic threshold theory has been widely used for evaluating exercise ability, predicting performance, and supervising exercise training. The use of anaerobic threshold intensity for scientific exercise training plays a crucial role in improving aerobic metabolic capacity.

II. Determination method of anaerobic threshold for endurance sports events

Endurance sports mainly refer to projects with low load intensity and long duration (more than 15 minutes), mainly metabolizing fat and sugar. There are two main methods for measuring anaerobic threshold, which have been very effective in measuring anaerobic threshold running speed for a long time. They are invasive assay and non-invasive assay, respectively.

2.1 Determination method of anaerobic threshold

By measuring the changes in blood lactate during incremental load exercise, blood samples are collected from the subjects at regular intervals during exercise. Generally, blood is collected directly from arteries or veins using catheterization, or from earlobes or fingers[5]. But this method has limitations. Firstly, the increase in skeletal muscle lactate during exercise is often asynchronous with the increase in blood lactate; When the sample size of the subjects is large, the range of individual lactate anaerobic threshold changes is large. Secondly, there are many blood collection points for blood lactate testing, which many athletes are unwilling to test and requires a large amount of equipment, technology, and funding. However, despite this, this method is still the most commonly used method for determining anaerobic threshold.

The determination of anaerobic threshold for ventilation requires the use of a gas analyzer, and the commonly measured gas metabolism indicators include lung ventilation, oxygen uptake, carbon dioxide excretion, respiratory quotient, etc[6]. The criteria for determining anaerobic threshold using ventilation anaerobic threshold testing are: during incremental load exercise, there is a linear increase inflection point in lung ventilation and oxygen uptake, or after the exercise load reaches a certain power, there is a steep increase in lung ventilation and oxygen uptake, while VE/V02 does not decrease. The inflection point on the relationship curve between oxygen uptake and carbon dioxide emissions can also be used to determine the anaerobic threshold[7].

2.2 Anaerobic threshold running test method

Anaerobic threshold running speed is the running speed of the human body at the anaerobic threshold intensity, or in other words, anaerobic threshold running speed is the speed that the body can reach or maintain at the critical point when transitioning from aerobic metabolism to the use of anaerobic energy supply. The difference in anaerobic threshold running is significant for athletes of different levels. For example, those who do not exercise regularly may quickly reach the anaerobic threshold and begin to use a large amount of anaerobic system function metabolism, while excellent high-level athletes will not start using anaerobic metabolism function for a long time after running. Therefore, it further demonstrates the rationality of using anaerobic threshold as an evaluation index for aerobic capacity, as well as the scientific nature of anaerobic threshold running exercises as a means of improving aerobic capacity training.

There are many methods for measuring anaerobic threshold running, and currently the commonly used ones are athletics fields and treadmills. Choose one of the more convenient measurement methods as treadmill measurement. Treadmills on the market all have heart rate monitoring and running speed adjustment functions. If not available, testing tools such as sports watches can be used to test the running speed of subjects at a certain benchmark heart rate on this device, which is very simple and clear. However, to ensure the accuracy of the test

data, it is important to note that participants should engage in necessary preparatory activities and sufficient stretching before the test. The test should only begin after the body has fully adapted, relaxed, stabilized, and immersed itself in the exercise environment. During the test, maintain a certain speed and stabilize the heart rate by adjusting the speed. When the subject's heart rate stabilizes at the baseline heart rate for about 30 seconds or longer and the speed remains unchanged, use this speed as the subject's score.

III. Physiological indicators of anaerobic threshold

During exercise, when the oxygen intake of the body is insufficient to meet the required oxygen level, it accelerates the participation of the body's anaerobic oxidation function. The athlete's body produces lactic acid, changes the ratio of lactic acid to pyruvic acid, and accelerates the accumulation of lactic acid. In order to adapt to the new environment in the body, the athlete's body undergoes a series of physiological changes. Some scholars have pointed out that anaerobic threshold training has a significant impact on the activity of blood urea, hemoglobin, and aerobic metabolic enzymes in athletes. Blood urea is an important indicator for evaluating training intensity and effectiveness; Hemoglobin to some extent represents the aerobic capacity of the body.

In competitive sports, especially endurance sports, many are converted from aerobic to anaerobic system function, so there must be a connection between anaerobic threshold and endurance sports ability. According to research, when AT is strong, the lactic acid generated by the body acts as an energy substance for the heart and skeletal muscles, while there is no accumulation of lactic acid in the blood. Athletes subjectively do not feel tired, which is beneficial for them to engage in longer periods of exercise; In the same amount of exercise, athletes with a high anaerobic threshold can complete it with higher intensity. Therefore, for aerobic endurance events, the anaerobic threshold represents aerobic metabolic capacity and the athlete's endurance level. In gradually increasing load activities, the later the anaerobic threshold appears, the better the athlete's aerobic metabolism ability. For anaerobic system functional projects, phosphate system and sugar hydrolysis system functions are required. At the beginning of the 100 meter and 200 meter runs, sugar is not oxidized or broken down, and the body first uses the ATP-CP system function. At this time, the body does not need oxygen or produce lactic acid. But this function can only last for about 7 seconds at most, after which the sugar hydrolysis system function is required. Therefore, anaerobic threshold has little effect on improving anaerobic metabolic capacity.

IV. Using anaerobic threshold training methods to improve adolescent endurance quality

The development level of aerobic fitness, like other qualities, is largely influenced by the level of human growth and development. The age range of 12-14 is a critical period for the development of aerobic endurance in adolescents. During practice, the appropriate load intensity standards for small, medium, and large loads are usually set at heart rates of 130, 150, and 170 beats per minute.

At present, interval training, continuous training, and repetitive training are widely used in sports training for the development of aerobic endurance, and each method can effectively practice different exercises. For teenage athletes, their physical potential has not yet been fully tapped and they are in the preparation period of the major cycle. In the training cycle, during the preparation period, due to the athlete's immature body in all aspects, the specific characteristics are not clear enough. Therefore, the first thing we need to develop is the physical fitness of athletes (including speed, endurance, strength, flexibility, agility) and the physical reserve of aerobic endurance. This is also to lay a solid foundation for high-intensity training and improving specialized abilities in the future. Firstly, establish exercise intensity based on the anaerobic threshold of adolescents. Using an intensity of 60% to 70% of the anaerobic threshold speed for long-term exercise for about 120 minutes can effectively improve athletes' aerobic endurance. This method can be used for recovery training after competitions or high-intensity training. Secondly, training at 80% to 90% of the anaerobic threshold speed can improve athletes' maximum aerobic endurance. In addition, we should also pay attention to the recovery after training. Aerobic endurance training takes a long time and consumes a lot of energy. Effective measures and methods should be taken to relax and recover the tired muscle and nervous system early, preparing for the next exercise.

In addition, we also need to pay attention to treating teenagers of different ages and levels differently in terms of training methods. For teenagers in the early stages of training, we only need to develop their aerobic endurance and various physical fitness exercises. For athletes with a certain systematic training foundation, we need to develop aerobic endurance while also incorporating exercises such as specialized endurance quality and specialized skill enhancement. Coaches also need to adjust and change their training methods appropriately according to the situation, keep up with the times, improve the scientificity and timeliness of training, and enhance the interest of young people in sports. Through research, we found that compared to maximum oxygen uptake, genetic factors account for less of the anaerobic threshold and there is greater room for improvement. And the size of the anaerobic threshold can determine the intensity of athletes during long-term exercise.

Therefore, it is very effective and reasonable for us to improve the endurance quality of adolescents through anaerobic threshold training methods.

V. Conclusion

This article mainly analyzes the characteristics of physical function in adolescents, the determination of anaerobic threshold in endurance sports, its application value, and how to scientifically develop training methods to improve the aerobic capacity of adolescents by using anaerobic threshold reasonably. The conclusion is as follows: anaerobic threshold is an important indicator for adolescents to improve their endurance level; It is an important basis for developing scientific training plans and intensities for adolescents with different anaerobic thresholds; It is the key to improving the performance of endurance sports for teenagers; Using 80% of the anaerobic threshold intensity can effectively improve the endurance quality of adolescents; After competitions or high-intensity training, about 60% of the participants can engage in long-term endurance running for recovery training; In the process of sports training, due to the underdeveloped physical functions of adolescents, 130/150/170 load heart rate is used as the appropriate load intensity for small, medium, and large loads. Repetitive training and continuous training are currently the best training methods to improve endurance quality, which can also perfectly match the development of adolescent endurance quality.

Reference

[1]. Liu Juncheng The effect of anaerobic threshold training on physiological indicators of athletes [J] Journal of Changchun University of Finance, 2009
[2]. The well is thick and bright The necessity and feasibility of using anaerobic threshold running speed as an endurance test indicator Journal of Xi'an Sport University, 2021
[3]. Chen Li Measurement of Anaerobic Threshold and Its Application in Exercise Training [J] Journal of Hunan University of Humanities and Technology, 2004
[4]. Li Yang Overview of Anaerobic Threshold and Its Research [J] Sports and Science, 2000
[5]. Wang Hui Physiological interpretation of phosphate system energy supply [J] Sports Human Science, 2015
[6]. Nicholas Mavry Anaerobic threshold and long-distance running ability [J] Journal of Shandong Sport University, 1992
[7]. Pei Jie Research progress on anaerobic threshold determination methods [J] Journal of Capital Institute of Physical Education, 2006

*Corresponding Author: Sun Lin